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COMPUTER OPERATIONS

Improvements Needed in Social Security's Capacity Management Program

GAO

United States
General Accounting Office
Washington, D.C. 20548

Information Management and
Technology Division

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January 18, 1989

The Honorable Dorcas R. Hardy
Commissioner of Social Security

Dear Ms. Hardy:

This report discusses our review of the Social Security Administration's computer capacity management program. We reviewed this program under our basic legislative authority to evaluate federal agencies and programs. Our review assessed the Social Security Administration's activities for managing existing computer resources and planning for future resource needs.

This report contains recommendations to you in chapter 4. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement of actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of this report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this report. We would appreciate receiving copies of these statements.

We are sending copies of this report to the Chairmen of the above Committees; the Director, Office of Management and Budget; and the Administrator, General Services Administration. This report was prepared under the direction of Melroy D. Quasney, Associate Director. Other major contributors are listed in appendix II.

Sincerely yours,

Ralph V. Carlone

Ralph V. Carlone
Assistant Comptroller General

Executive Summary

Purpose

The Social Security Administration (SSA) depends heavily on computers to perform its mission, which includes maintaining records on over 300 million people and paying in excess of $230 billion annually in benefits to over 40 million people. Since 1982, the agency has estimated it has spent approximately $643 million for its computer systems and is planning to spend about $170 million in fiscal year 1989 to maintain and further modernize its systems.

Because of the considerable investment in the agency's computer systems and their importance to the agency's mission, GAO reviewed SSA's computer capacity management activities to evaluate the effectiveness of SSA's activities for managing existing computer resources and planning for future resource needs.

Background

In 1982, SSA proposed a comprehensive 5-year modernization plan for all of its computer systems that included the purchase and installation of new high-speed mainframe computers and associated hardware to, among other things, expand and modernize the processing capabilities of its field offices. In June 1987, SSA purchased three mainframe computers to support redesigned software programs and other field office system upgrades. The agency spent $5.1 million in September 1988 to increase its computer capacity, and is now planning additional computer procurements for 1989 and perhaps 1990 to support the field office system.

Federal Information Resources Management Regulations require government agencies to conduct capacity management activities in planning for and acquiring computer resources. Such activities are important because they provide agencies with information about 1) the computer capacity current operations are using and 2) the additional computer capacity that will be required to support increased automation. Capacity management activities include collecting and analyzing detailed performance data on current computer processing, and comprehensive modeling and pilot testing of planned computer systems.

Results in Brief

GAO found that SSA has not effectively performed capacity management activities needed to accurately assess its computer capacity needs. While the agency has collected some data and performed some systems modeling and pilot testing, these activities have not been adequately performed to enable SSA to determine computer capacity requirements with

reasonable assurance. Further, an SSA internal study team and two contractors reported during the past year that the agency's capacity management program needed improvement in many areas.

SSA has initiated actions to improve its capacity management program and expects to complete these actions by the end of 1989. While the agency's actions are noteworthy, until further capacity management improvements are completed, SSA will not know with assurance how much computer capacity is required to support its operations—information it needs to effectively justify future computer procurements.

Principal Findings

Collection and Analysis of Capacity Management Information Needs Improvement

Federal Information Resources Management Regulation 201-30 (Management of ADP Resources) requires the routine collection and analysis of detailed capacity management data to measure current computer use and needs, and to predict future capacity requirements. SSA does not systematically collect and analyze sufficiently detailed data to effectively perform these functions. For instance, while the agency prepares various reports on total system utilization, these reports do not have sufficient detail at the transaction level that SSA needs to effectively determine whether the current computer processing environment is operating effectively and efficiently. (See pp. 14 and 15.)

Data Limitations Affecting SSA's Modeling Efforts

Modeling, a technique for simulating computer system performance under various assumptions, can be used to help satisfy federal regulation requirements for analyzing current computer performance and predicting future capacity requirements. Inadequate data collection (1) during new software development and pilot testing and (2) from current computer utilization have adversely affected the reliability of SSA's modeling efforts. For example, one of the agency's modeling efforts indicates that the capacity of the current computer system used to support the field offices may be exceeded in 1988 in the worst case scenario, or, in the best case scenario, may be sufficient until 1992. The disparity between these results raises questions as to when and how much additional computer capacity is required to meet SSA's needs. (See p. 17.)

Independent Assessments Find Capacity Management Activities Need Improvement to Better Justify Future Procurements

In May 1987, approximately 5 months after we began this review, SSA formed a capacity modeling and planning team to evaluate and improve its capacity management program. In 1988, the agency also had two contractors perform independent assessments of the capacity management program, one as part of a larger study of SSA's integration planning process, the other specifically related to the agency's capacity management process. The evaluation specifically relating to SSA's capacity management process recognized the maturity and comprehensiveness of the process the agency was implementing and reported that the process as it now stands is producing some valuable and directly useful information. However, all three evaluations raised questions about SSA's ability to reasonably determine the agency's current and future computer capacity requirements and recommended actions designed to improve the agency's data gathering and modeling activities, and its overall management of the capacity planning and procurement processes. (See pp. 20 to 23.)

Efforts to Improve Capacity Management Not Yet Complete

The agency has implemented some of the recommended corrective actions, such as better defining the capacity management program, and establishing user service agreements for its on-line system. SSA also has a schedule for further improving its capacity management activities, and estimates that these improvements will take about a year to implement. Until improvements to the capacity management program are completed, SSA will not be able to effectively determine its ongoing capacity requirements, and therefore provide assurance that its future computer acquisitions are justified. (See p. 23.)

Recommendations to the Secretary of Health and Human Services

GAO recommends that the Secretary of Health and Human Services direct the Commissioner of Social Security to:

- ensure that SSA improves its capacity management program as currently scheduled and uses this program to justify future acquisitions.
- avoid executing major computer acquisitions until an effective capacity management program is in place. If SSA believes that computer resources must be acquired before an effective capacity management program is in place, it should demonstrate that such acquisitions are the most appropriate means for meeting its immediate needs.

Further, GAO recommends that the Secretary direct the Commissioner to report the lack of effective capacity management as a material control

weakness under the Federal Managers' Financial Integrity Act until an improved program has been implemented. (See p. 26.)

Agency Comments

In commenting on a draft of this report, the Department of Health and Human Services agreed with GAO's recommendations on the need for improvements in SSA's capacity management program. The Department also commented, however, that it is uncertain whether SSA's improved capacity management program will be fully implemented in time to justify a major computer acquisition planned for 1989 or 1990. In that case, SSA plans to develop the data necessary to support such a procurement. GAO agrees that SSA should demonstrate through sufficient data and thorough analysis that such acquisitions are the most appropriate for meeting the agency's immediate needs. (See pp. 26 and 27.)

The Department disagreed with GAO's recommendation that it report the lack of effective capacity management as a material control weakness under the Federal Managers' Financial Integrity Act. GAO believes that a capacity management program is an integral part of effective computer operations. Since computer operations are central to SSA fulfilling its mission, GAO believes the inadequacy of SSA's program constitutes a material weakness under the Act. (See p. 28.)

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Abbreviations

ADP	automated data processing
GAO	General Accounting Office
IMTEC	Information Management and Technology Division
SSA	Social Security Administration

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Introduction

Social Security Administration (SSA) programs affect millions of wage earners and Social Security beneficiaries. The agency's primary programs are the Retirement, Survivors, and Disability Insurance Program and the Supplemental Security Income, Aged, Blind, and Disabled Program.

SSA's computer operations in support of these programs are extensive because they serve a large client population and maintain records for past, current, and future beneficiaries. The agency maintains one of the largest automated collections of data in the world. SSA computer operations process monthly benefit payments to over 40 million people, and maintain master record information for over 300 million people. Total annual benefit payments exceed $230 billion. The data is contained in files that are accessed and updated when inquiries are made against them, when social security beneficiaries make claims, or when beneficiaries move or change eligibility status.

SSA spends hundreds of millions of dollars every year to maintain and modernize its computer systems. For instance, SSA estimated in 1987 that the agency would spend approximately $643 million from fiscal year 1982 through fiscal year 1988 to modernize and maintain its computer operations and is currently planning to spend another $170 million in fiscal year 1989.

SSA's Computer Modernization Plan

To improve its computer systems, SSA proposed a comprehensive 5-year Systems Modernization Plan in 1982. A primary emphasis of the plan was to allow more immediate service to clients while they were in an SSA field office through a new on-line system.[1] While SSA uses batch[2] and on-line systems to serve clients, a goal of the systems modernization was to increase on-line transactions. In order to implement the new on-line system, SSA:

- is replacing and expanding terminal and communications equipment in field locations by replacing a system of 4,200 terminals and the associated older communications network[3] that supported certain client services, with 25,530 new terminals and a new data communications

[1]An on-line system forwards transactions to the computer and processes them as soon as they are received.

[2]A batch system collects and stores transactions in batches for processing and reports all exceptions within a batch after processing has occurred.

[3]Social Security Administration Data Acquisition and Response System.

network. The increased number of terminals will give field office representatives additional devices for accessing SSA's master files.

- is redesigning and upgrading its beneficiary-related software applications. The Claims Modernization Project, which is part of this effort, involves modernizing the processes for collecting initial claims data and determining eligibility and benefit amounts by redesigning claims software. As of April 1988, redesigned software had been installed to allow field staff to directly enter initial claims information through computer terminals rather than requiring clients to fill out forms. Other claims modernization efforts under development will allow field staff to determine client eligibility and compute benefit amounts immediately through the new on-line system. Under the current (batch oriented) system, the client submits required information while in the field office, and must wait until some later date for SSA to make a determination regarding eligibility status and benefit amounts.
- has improved the data storage and access methods of SSA's master computer files to enhance access to the master files by field locations.
- has replaced the computers in SSA's main computer center with new, more powerful computers to support the processing requirements of the on-line system.

SSA is currently installing the hardware and software to implement its on-line system. In June 1987, SSA purchased and installed three mainframe computers in the headquarters data center to serve as processing units for the 25,530 terminals being installed in headquarters, in approximately 1340 field offices, and in seven processing centers throughout the country. SSA had, as of September 1988, installed 23,576 of its planned 25,530 terminals.

Concurrent with the implementation of the new on-line system, SSA is phasing out its older terminals and data communications system. Once the functions currently performed on the older network are implemented on SSA's new data communications network, the older network will be phased out.

Capacity Management Is an Integral Part of Computer Operations

Capacity management programs provide a capability to ensure that computer systems are (1) properly designed and configured to give efficient performance, and (2) have sufficient computer capacity for present and future operations. Federal Information Resources Management Regulation parts 201-16, 201-20, and 201-30 require government agencies to conduct capacity management activities in planning, acquiring,

and using their computer resources. The regulations require that agencies do short- and long-range acquisition planning, which should include:

- analyzing trends in data processing work loads to determine if and when existing system capabilities will be saturated, and
- conducting a comprehensive requirements analysis, including the present and projected work load in terms of data handling or transaction processing by type and volume, to justify the acquisition of additional computer capacity.

The National Bureau of Standards offers work load analysis and forecasting guidance to federal agencies. For example, the Bureau's publication on computer performance management (Publication 49) states that automated data processing (ADP) managers must have detailed information concerning current computer work load in order to enhance the current system effectively and to construct valid models with which to predict future resource requirements. Standard industry practices also suggest that organizations institute effective capacity management programs to understand how resources can be used to make computer systems perform as efficiently as possible and to plan ahead for future needs.

Capacity management includes performance management and capacity planning. Performance management involves analyzing the performance of a computer system to determine how resources are currently utilized and how such utilization can be improved. It is the part of capacity management that deals with the day-to-day requirements of delivering acceptable service to users. Levels of service are gauged by such measures as response time, job completion (turnaround) time, availability and reliability of computer equipment, cost of operation, and accuracy of output. Specific activities consist of collecting and analyzing information on the performance of an existing system and locating real or potential bottlenecks in system performance. For example, if good performance management activities are in place, an agency can determine whether its data access system is efficient. If tests and machine monitoring devices indicate that slow access to stored data is adversely affecting user response time, the agency can make adjustments, such as adding paths (or channels) from the computer to the data storage devices to enhance system performance. Ongoing performance management activities can locate trouble spots and enable the agency to make necessary adjustments to optimize computer performance.

Capacity planning assists in forecasting computer resource requirements to ensure that capacity exists when needed. Capacity planning supports the procurement process by identifying and justifying system additions and enhancements that will be required both in the near and long term. Capacity planning activities use current system performance data as a starting point to predict future resource needs. Modeling and pilot testing are two activities that can be used in capacity planning to provide data on future requirements and system performance. During the capacity planning process, the total future work load and required user service levels are predicted, resources required to handle the work load and service levels are proposed, planned upgrades are modeled and pilot tested, and the ultimate configuration is defined.

Objective, Scope, and Methodology

The objective of our review was to evaluate the effectiveness of SSA's activities for managing existing computer resources and planning for future resource needs. To meet our objective, we:

- interviewed SSA's managers for hardware and software activities regarding procedures used to analyze past and current performance of the online system,
- reviewed data collection documents, such as computer monitoring reports and reports of modeling results and pilot test results to determine (1) how these activities have been developed at SSA, and (2) the types of information being collected at SSA,
- reviewed reports from SSA's integration and management contractor on SSA's integration planning process and SSA's integrated management plan,
- reviewed a report from SSA's contractors on modeling activities,
- interviewed SSA officials responsible for managing computer procurements and submitting budgets to evaluate how these functions were integrated into the capacity management function,
- reviewed documents pertaining to SSA's planned hardware procurements and planned software implementation schedule to evaluate whether these were adequately coordinated with capacity management activities, and
- evaluated reports on 18 field offices, regional facilities, processing centers, and a teleservice center, designated as "barometer offices," to supply daily performance feedback from system users to the computer facilities at headquarters.

As criteria to determine the effectiveness of SSA's capacity management program, we used the Federal Information Resources Management Regulation, parts 201-16, 201-20, and 201-30 and the National Bureau of Standards work load analysis and forecasting guidelines in Federal Information Processing Standards Publications 49 and 75. We also talked to management at the National Institutes of Health, the Department of Justice, and a private life insurance company to get a broader perspective on capacity management activities at other large organizations that have large computer facilities.

Our audit work was conducted between January 1987 and September 1988. Our work was performed in accordance with generally accepted government auditing standards. We provided a copy of a draft of this report to the Department of Health and Human Services for its review and comment. The Department's comments are included in their entirety in appendix I and are summarized at the end of each chapter of this report when pertinent.

Chapter 2

Improvements Needed in SSA's Capacity Management Program

SSA's initiative to modernize its computer operations and implement a new on-line system includes changes in many components of the computer environment—redesigned software, new data communications and operating systems, different data storage devices, and a new data management and access system. Federal regulations require that an effective capacity management program be in place to provide the capability to ensure that system components operate together efficiently, and that sufficient computer capacity is available to implement software work loads scheduled to be processed on the system.

We found that SSA does not have an effective capacity management program. Although the agency does some data collection and analysis, pilot testing, and modeling—all basic elements of a good capacity management program—it does not systematically collect and analyze sufficiently detailed data on planned work loads early enough in the software development process to ensure that capacity planning activities can be performed throughout the development cycle. Because work load data is not available when needed, the agency cannot model the system effectively to predict computer capacity needs accurately. Further, the agency has not used pilot testing to (a) evaluate how all of the system's various components operate together, or (b) assess actual traffic patterns as the components are installed. This inhibits SSA's ability to predict and make adjustments to avoid potential system implementation problems and plan for computer capacity requirements.

These conditions are not new. In August 1986, we reported that SSA was acquiring components for its new on-line system for field offices without the analyses and testing required by federal regulations to support such significant purchases.[1] We were concerned that in the absence of these analyses and tests, SSA would be unable to predict the performance of the fully deployed system. Our concerns were justified in that even though SSA has expanded its computer capacity to support the new system, it has experienced performance problems, such as slow system response times and unavailability of the system. The agency now believes that additional computer capacity is needed to fully implement the system, even though the computers that were installed in January 1988 were intended to support the entire system.

[1] ADP Acquisitions: SSA Should Limit ADP Procurements Until Further Testing is Performed, (GAO/IMTEC-86-31, Aug. 8, 1986)

Sufficiently Detailed Data Not Systematically Collected or Analyzed

Both performance management and capacity planning rely on the collection of detailed and accurate performance data on computer activities to monitor current operations, such as computer capacity utilization and average response time, and to predict future capacity requirements. SSA does not systematically collect and analyze sufficiently detailed capacity management data on current and future computer operations.

Federal Information Resources Management Regulation 201-30 (Management of ADP Resources) states that agency computer acquisitions and ongoing computer operations should be supported by information on the present and projected work load in terms of:

- data handling or transaction processing by type and volume,
- output needs and associated telecommunications support, and
- a performance evaluation of the currently installed ADP system(s) to provide a baseline for evaluation of proposed alternatives for meeting data processing needs.

In our August 1986 report, we noted that SSA was determining its computer resource requirements from work load analysis for a number of software requirements that had not been defined or validated.[2] As a result, the work load projections that SSA performed produced results that varied widely. For example, a critical work load element of the system—transactions per terminal per hour—had been estimated in one study to be 10.8 and in another to be 36.4. Such variances in data make predicting resource requirements difficult because the lower transaction rate per hour would require considerably less computer capacity than the higher transaction rate. We recommended that SSA not commit to procuring all of the on-line system computers and other equipment until more reliable work load data were gathered and analyzed.

In August 1986, SSA began preparing capacity baseline chart reports that contain utilization information for various components of the on-line system, such as the percentage of time a computer is in use throughout the day or the hours of maximum computer utilization. This data, however, is not sufficiently detailed for use in computer capacity planning. For example, although SSA collects data on the total computer resources consumed by batch and on-line software applications, it does not collect performance data by individual applications. Federal Information Resources Management Regulations require that agencies consider such detailed information during requirements analysis because knowledge of

[2](GAO/IMTEC-86-31, Aug. 8, 1986).

individual work load growth patterns helps to accurately predict future computer capacity requirements.

In addition to not collecting sufficiently detailed data on its software applications, SSA does not have mechanisms in place to ensure that appropriate procedures for information collection are followed. For example, SSA's integration and management contractor said that there currently are several SSA forms associated with ADP planning that would supply useful capacity information.[3] However, the contractor noted that these forms are optional and ask very technical questions that users and requirements developers cannot always answer. As a result, these forms are not routinely completed for the Office of Systems Operations to use in planning future resource needs.

The SSA Division Director, Division of Operational Capacity Performance Management, and staff said that implementing and enforcing a data collection program across many different organizations in the agency has been difficult to coordinate. They added that (1) the current information format of the baseline utilization reports is used mainly to give management an overview of computer operations rather than for capacity planning purposes, (2) more detailed information is necessary to be useful for capacity management activities, and (3) organizing the routine collection, retention, and reporting of data into useful performance information would give responsible staff more time to analyze how to improve computer performance. They are currently evaluating alternatives for implementing an improved data collection system.

Insufficient Information Adversely Affecting Accuracy of System Modeling

Although SSA uses computer modeling as a technique to project ADP needs, the lack of work load information on planned software applications has prevented the agency from generating accurate results from its modeling efforts. Consequently, SSA's modeling projection of its current computer capacity ranges from, in the best case scenario, being sufficient to meet the agency's needs through calendar year 1992, to, in the worst case scenario, meeting the agency's needs only through calendar year 1988. Further, while pilot testing can generate information for use in increasing the reliability of modeling, SSA's pilot testing has not been used to test all components of its planned computer system. Consequently, the agency's pilot tests were not sufficient to predict the work

[3]SSA contracted with an integration and management contractor in 1987 to provide information that enhances the capability of senior management to measure the agency's overall collective progress in accomplishing strategic goals and provides senior management with a basis for decision and action.

load that was generated as SSA implemented the various elements of its planned system.

Detailed Information Not Available for System Modeling

Computer modeling is a technique that can be used to meet Federal Information Resources Management Regulation parts 201-16 and 201-30 that require agencies to periodically determine their capability to meet current and projected ADP needs. Modeling is an iterative process that begins when the requirements for a software application have been defined and becomes increasingly more detailed as the complete system under development progresses. In order to predict both total system performance and total system capacity requirements, all of the software applications and their associated expected work loads that will be processed on the system should be included in the model. For instance, if a computer system is scheduled to process three separate software application work loads, these should be modeled together along with simulations of the proposed computer operating system, telecommunications system, data base management system, and other system components. Without such a simulation, it is difficult to accurately predict how the complete system will operate, or how much computer capacity will be required.

In February 1988, the Deputy Commissioner, Office of Operations, and staff, told us that of the seven software application work loads being modeled, only one had sufficient actual data for predicting performance characteristics or capacity requirements with any reliability. While data was available on two other software application work loads, the officials said the data was less detailed and was of less value in predicting future performance or capacity requirements. The officials said that they were in the data gathering stage for the remaining software application work loads scheduled for modeling, and could not predict the performance or capacity requirements of them.

Without detailed information on these work loads, SSA has been unable to accurately model and predict capacity requirements for the system work loads with any degree of reliability. For example, the agency estimated as late as May 1987, that three computers, procured in June 1987 with installation completed in January 1988, would have sufficient capacity to process all of the software application work loads scheduled for the on-line system. Because of delays and changes in software design specifications, only two of the originally scheduled work loads are currently on-line. However, studies conducted in October 1987 estimated that these two software application work loads alone could exceed the

capacity of the three new computers. SSA said they may have underestimated the computer capacity requirements for the total on-line system by as much as 75 percent.

In February 1988, the SSA Director, Operational Capacity Planning and Management, told us that the agency had projected a best, most likely, and worst case scenario of future computer resource needs for its on-line system. The official also said computer capacity estimates from modeling activities varied according to (1) the number of transactions per claim, and (2) the version of modernized software to be processed by the on-line system. Because SSA did not have firm information on the number of transactions per claim using modernized software, the estimated transactions used in the model ranged from 120 to 180 transactions per claim, with the most likely projection being 150 transactions per claim. Consequently, the results of the February 1988 modeling were inconclusive because of the uncertainty of transaction rates for the version of software used in the model. Using the best case scenario, SSA predicted that its on-line computer capacity could be sufficient until at least 1992. However, the worst case scenario predictions were that capacity would be exceeded late in calendar year 1988, while the most likely case scenario predictions were that capacity would be exceeded in the second half of 1989.

In September 1988, SSA spent $5.1 million to increase the capacity of the computers purchased in June 1987. SSA is presently preparing justifications for procuring additional computers in 1989 and possibly in 1990. The agency believes that more capacity is necessary to process new software planned for the on-line system. However, unless SSA refines its capacity forecasting efforts, the agency will not be able to accurately predict capacity requirements for the new software.

Pilot Testing Efforts Limited

Agencies are required to use validation techniques (such as pilot tests) to reduce the risks that: (1) insufficient capacity or degraded ADP performance may adversely affect an agency's mission or (2) excessive capacity or capability may be acquired. Data from pilot tests can be used to verify or refine modeling assumptions by comparing these assumptions against data accumulated from actual testing during the pilot.

The more complete the pilot tests, the more useful the data that it produces. While SSA established a pilot test program for the on-line system, the program was primarily designed to validate new or revised claims

software to ensure that the software was accurate, comprehensive, and adaptable to field operations. In August 1986, we reported that SSA's pilot test would not provide an adequate test of the proposed system's performance because it was not a comprehensive test of the proposed configuration of the hardware and software applications under development.[4] At the time, the Secretary of Health and Human Services said that SSA had sufficient pilot experience to support the procurement and installation of its network and terminals nationwide.

Also in December 1986, we reported that SSA had originally planned to install and test about 20 terminals at each of 18 pilot test field offices.[5] However, because the agency had difficulties obtaining the planned number of terminals, it installed and tested only three terminals at each of the 18 field offices. At that time, we reported that with this reduced number of terminals, SSA had not obtained sufficient information to provide conclusive results on the claims modernization project's impact on the operational performance of the system, field office positions, or service to the public. We also noted that the agency's test was limited because it evaluated individual hardware and software components in a piecemeal fashion, rather than providing for an overall and thorough measure of projected performance of the components before they are deployed.

In December 1987, the SSA Deputy Associate Commissioner, Office of Systems Integration, told us that field offices had been experiencing performance and reliability problems with the new on-line system. The problems included slow terminal response times, excessive periods when the system was inoperable, and difficulty in gaining access to the system. The official believed the problems were caused in part by large work load increases caused by the additional terminals being installed in field offices nationwide. In addition to supporting the redesigned software, these terminals provided expanded on-line access to information in existing master files. The official attributed this large increase in activity to a work load that existed in the field offices but was not evaluated during the pilot tests that were designed to test the software and not the expanded on-line access capability. With the installation of the new terminals in the field offices, this work load became apparent and caused problems.

[4]ADP Acquisitions: SSA Should Limit ADP Procurements Until Further Testing Is Performed (GAO/IMTEC-86-31, Aug. 8, 1986).

[5]Software Systems: SSA Encountering Significant Delays In Its Claims Modernization Project (GAO/IMTEC-87-8, Dec. 22, 1986).

Agency Comments and Our Evaluation

In its comments on a draft of this report, the Department of Health and Human services said that they agree that SSA did not adequately pilot the use of existing on-line access to master files. The Department said that it was their belief that since this access was already available for several years, the agency could predict with some accuracy the growth that would take place when more terminals, with the same access capabilities, were installed in the field. However, the significantly higher use of this access capability by field personnel who deal directly with the public was not anticipated.

The Department said that SSA did pilot its new modernized claims software extensively. During the pilot operation, the agency found additional functions that would improve the claims process for the public. These improvements resulted in a need for additional capacity. SSA agrees that allowing more users to access existing software in a new system should be piloted. The Department said that the agency will fully pilot test, when possible, the complete system when major changes are made. We agree that pilot testing the complete environment when major changes are made would enable the agency to predict its resource requirements and the projected performance of all hardware and software components.

Independent Assessments Find Significant Improvement Needed in SSA's Capacity Management Program

SSA has conducted its own internal evaluation of its capacity management program and had two contractors perform independent assessments of the program. The evaluations have found similar problems in the agency's capacity management program such as insufficient data collection, and inadequate capacity management activities to justify procurements. The evaluations have recommended corrective actions.

Until the agency acts to correct its capacity management program, it will not be able to effectively ensure that procurements of additional computer resources are the best means to meet the agency's needs. The inadequacy of SSA's capacity management program constitutes a material weakness under the Federal Managers' Financial Integrity Act 31 U.S.C. 3512 (b) and (c). This weakness is regarded as material given the fact that a capacity management program is an integral part of effective computer operations, which is central to SSA fulfilling its mission.

SSA has implemented some actions, such as better defining the capacity management program; however, agency officials have told us that major corrective actions will take about 1 year to implement.

SSA Evaluated Its Capacity Management Program

SSA's capacity planning and modeling team was formed in May 1987, approximately 5 months after we began this review, to improve the agency's capacity planning process and capacity modeling program. The team's purpose was to develop a series of models with specific timeframes for completing them and to develop a capacity planning process, present this process to the Office of Systems Operations management for their modification and approval, and institutionalize the approved capacity planning process.

In October 1987, the team proposed a capacity management program that would be the responsibility of the Office of Systems Operations. The responsibilities of the Office of Systems Operations include:

- directing the development, implementation, and maintenance of computer operating systems;
- directing and controlling all activities relating to the development, implementation, and maintenance of software;
- formulating an officewide plan for the Office of Systems Operations and assigning responsibility among major Office components for various parts of the plan; and
- providing the analysis and testing necessary to develop and maintain current, new, and redesigned systems.

In its proposal, the capacity planning and modeling team identified four interdependent processes that constitute capacity management: capacity planning, performance management, procurement management, and resource accounting.[1] Also, the team identified problems and solutions in each of these areas and implications for the Office of System Operations if solutions are to be implemented. The team said that many of the problems they identified were a result of responsibilities being fragmented and the lack of formal procedures. For instance, the team found that the existing capacity planning process was fragmented across several organizations, and was not capable of producing sufficiently valid work load projections.

In terms of performance management, the team's report said that there were difficulties in obtaining current performance data, and that excessive time was spent gathering and maintaining system data rather than analyzing performance data. The report also cited problems in the procurement area including (1) the ad-hoc character of many SSA procurements to satisfy immediate needs rather than long-range, well-planned projects, (2) the difficulty experienced in developing accurate and dependable requirements statements, and (3) the difficulty in proposing state-of-the-art technical solutions to satisfy requirements.

Many of the solutions the team proposed to address the capacity management problems require the consolidation and reorganization of responsibilities within the Office of System Operations, and the implementation of formal procedures to better manage and procure computer resources. For instance, to alleviate problems in the procurement area the team proposed that SSA:

- improve the capacity planning process to improve the quality of the requirements analysis and the timeliness of developmental efforts,
- concentrate the responsibility for procurements in order to focus the required expertise and managerial responsibility, and
- develop and publish updated agency procurement procedures to clarify procurement documentation requirements and the approval process.

The team also proposed organizational changes to support capacity management implementation, including the creation of a procurement review staff within the office of the Associate Commissioner, and the

[1]Resource accounting is a means of distributing ADP costs to users. It is used in many organizations and is sometimes considered a part of capacity management because it makes users aware of ADP resource utilization and the costs of meeting their needs.

formation of a capacity planning branch responsible for the analysis of capacity requirements, development of computer configurations, and publication of tactical capacity plans.

SSA Contractors Evaluated SSA's Capacity Management Program

Two contractors have performed independent assessments of SSA's capacity management program, one as part of a larger study, the other specifically relating to SSA's capacity management process. In a March 1988 study of SSA's current integration planning process, SSA's integration and management contractor said that hardware procurements cannot be initiated until the requirements definition and analysis stage of the software development life cycle is near completion. The contractor said that this was necessary in order to adhere to federal procurement regulations requiring detailed documentation including functional requirements, work load projections, analysis of alternatives, and cost/benefit analyses. Although mechanisms in SSA's Software Engineering Technology Manual provide procedures for the Office of System Operations' involvement in software project planning, in actuality, this does not routinely happen. As a result, the Office of System Operations often made a "best guess" as to how much capacity, storage, and networking would be needed. The contractor added that recently, the Office of Strategic Operations has taken a more proactive role in requesting and obtaining information needed for capacity planning. However, the contractor said that the historical lack of integration between software and hardware projects had contributed to current capacity problems and, as a result, implementation of some new software will be delayed.

The results of the review that specifically related to SSA's capacity modeling and planning program were reported in July 1988. The review found that SSA's capacity management process as it now stands is producing valuable and directly useful information. For example, the process identified ways to reduce the demands on computer capacity during times when the computers are heavily used by switching batch activity from these prime periods to times when there is less demand on computer capacity. However, the review also reported areas that "need improvement" or "need significant improvement." Some of the findings of this independent assessment include:

- Agency procedures for modeling current work loads were in need of significant improvement. For instance, the contractor identified eight criteria for success in modeling, including (1) detailed levels of work load, (2) clearly defined scenarios, and (3) analysis of performance bottlenecks. The contractor found that none of the criteria had been met in

modeling major current work loads, and that no models of the major work loads existed to support the interim upgrade procurement conducted by SSA in September 1988.

- In several cases SSA's projected capacity requirements for the agency's on-line work loads are not justified with any degree of precision. For instance, projections for the future capacity requirements for a major on-line work load had been characterized as a "complete guess" by the SSA capacity management staff. The contractor said that given the potential cost of the recommended upgrade and the time available to analyze the work load, a more refined estimate would be appropriate.

On the basis of the review, the contractor concluded that the current 5-year forecast for SSA computer capacity might not be accurate. The contractor said that (1) the forecast requires additional refinement by SSA prior to the forecast being suitable for supporting a major procurement such as the forthcoming 1990 procurement, (2) SSA capacity management personnel are aware of the potential inaccuracies in the forecast and are actively working to refine the forecast, and (3) all indications are that subsequent refinements will provide for comprehensive assessments of computer upgrade requirements.

Efforts to Improve Capacity Management Not Yet Complete

In July 1988, we spoke to the Deputy Assistant Commissioner for System Operations, the Senior Advisor to the Deputy Commissioner for Operations, and the Director, Division of Operations, Capacity Planning. They told us that SSA is developing systems and procedures to ensure that capacity planning issues are addressed by all organizational components involved in computer operations at the appropriate time. They also said that SSA is looking at the findings and recommendations of the capacity management consultant and developing action plans to make the recommended improvements. For example, SSA has followed the capacity management contractor's recommendation that SSA establish user service agreements for its on-line system. They said that SSA should be able to complete other recommended improvements in about 1 year.

Agency Comments and Our Evaluation

In its comments on a draft of this report, the Department of Health and Human Services said that SSA recently had a detailed study of its capacity management program performed by an expert in the field of capacity planning. The Department commented that although the study gave the agency reasonably high marks, it also made a number of specific recommendations for improvement that were sound and for which the Department has developed a comprehensive plan of action to ensure

implementation. The Department also commented that some of these recommendations have already been completed and the balance are scheduled for completion by the end of 1989. By that time, the Department predicts that the agency will be in a position where its capacity management program is routinely providing the kind of information needed to, among other things, justify the acquisition of necessary computer resources. In this chapter, we recognize the efforts that SSA is making to improve its capacity management program.

Chapter 4

Conclusions and Recommendations

SSA is at a critical stage in its computer modernization effort. It is implementing a large, on-line system that involves increasing the number of terminals at field offices, modernizing the data network, and providing more on-line software applications. As the system is installed and implemented, SSA field staff will become increasingly dependent on the system's reliability in carrying out the day-to-day mission of the agency.

Currently, SSA does not have an adequate capacity management program to ensure that its computer resources will be used effectively. Performance data on current and future software work loads is not collected in sufficient detail to be of use in capacity management activities, such as modeling, to predict resource needs of individual applications and the expected performance of the total system. In addition, while pilot testing has been used to test and validate software, it has not been used to gather important capacity planning information on all components of the on-line system or to increase the reliability of the modeling process. Finally, although SSA says it does not have sufficient computer capacity to process additional software work loads, both we and SSA's contractors believe that SSA has to supply more specific analysis to justify procurements of additional hardware.

In past reports, we raised concerns about the potential consequences of not effectively pilot testing all operational aspects of the new system and recommended that SSA not proceed with planned acquisitions until it had better information to determine its needs. In response to those reports, the Secretary of Health and Human Services said that SSA had sufficient pilot experience to support the procurement and installation of its network and terminals nationwide and proceeded with the acquisition of terminals and computers that SSA thought would be adequate to support the total on-line system. Now, although SSA estimated in 1987 that the agency would spend approximately $643 million dollars through fiscal year 1988 to modernize and maintain its computer operations, it has experienced slow response times and periods when the system was inoperable. Further, SSA now believes that it needs additional computer capacity to support the on-line system, although it has not adequately modeled additional software applications to accurately predict its needs.

SSA officials agree that capacity management activities have been inadequate in the past and are trying to improve performance in the agency's program. They are currently reviewing the capacity planning and modeling team's proposals and their contractors' reports for improving capacity management. SSA has a tentative schedule of 1 year to improve

its capacity management program. However, despite acknowledging weaknesses in its capacity management program, the agency is planning to procure additional computers because it believes that it will need more capacity to implement additional on-line software. Until SSA implements a better capacity management program it will not be able to ensure that the planned procurements are the most appropriate actions. We also believe that the lack of an adequate capacity management program is a material weakness under the Federal Managers' Financial Integrity Act 31 U.S.C. 3512 (b) and (c).

Unless SSA improves its computer capacity management program, it will not be able to ensure that it is managing its computer resources efficiently. In addition, without a better capacity management program, SSA will not be able to ensure that, in the future, it procures the right equipment at the right time and in the right amounts to support the mission effectively.

Recommendations

GAO recommends that the Secretary of Health and Human Services direct the Commissioner of Social Security to:

- ensure that SSA improves its capacity management program as currently scheduled and uses this program to justify future acquisitions,
- avoid executing major computer acquisitions until an effective capacity management program is in place, and
- in the event that SSA believes that computer resources must be acquired to support day-to-day operations before an effective capacity management program is in place, it should demonstrate through sufficient data and thorough analysis, that such acquisitions are the most appropriate means for meeting its immediate needs.

Further, GAO recommends that the Secretary direct the Commissioner to report the lack of effective capacity management as a material control weakness under the Federal Managers' Financial Integrity Act until an improved program has been implemented.

Agency Comments and Our Evaluation

We requested comments on a draft of this report from the Department of Health and Human Services. The Department agreed that SSA's capacity management program was in need of improvements. However, the Department believes that the report does not reflect some of the changes that the agency has made in its capacity management program since 1987 and that the agency's program is in better condition than our

assessment would indicate. We do refer in the report to improvements in program areas made through September 1988 where the agency had documented these efforts for us. However, our audit work since 1987, along with a consultant's report dated July 1988, demonstrates that our report accurately reflects the status of SSA's capacity management program as of September 1988. (see pp. 22-24).

The Department agrees with our recommendation that SSA should ensure improvements are made to its capacity management program as currently scheduled and use this program to justify future acquisitions. The Department st..ed that the agency is scheduled to implement all of the recommended improvements by the end of 1989.

The Department also agrees with our recommendation that SSA should avoid executing major computer acquisitions until an effective capacity management program is in place. However, the Department does not believe SSA should avoid acquisitions until an effective program is in place if such action would put the agency's mission at undue risk. The Department states that current plans call for executing a major computer acquisition by the end of 1989 or the beginning of 1990. SSA believes that this major procurement should be executed even if all of SSA's capacity management improvements have not been made, as long as the agency has provided sufficient data to support the procurement. The Department believes it is important to recognize that an organization can develop the data necessary to support a procurement action without necessarily having implemented every recommendation made on its capacity management program.

Our recommendation that SSA avoid executing major computer acquisitions was not intended to put the agency's mission at risk. Rather, it is intended to caution the agency from proceeding with major procurements until an effective capacity management program is in place to support the nature and extent of planned computer capacity acquisitions. Also, we acknowledge that if the agency believes that computer resources must be acquired to support day-to-day operations before an effective capacity management program is in place, it should demonstrate through sufficient data and thorough analysis that such acquisitions are the most appropriate for meeting its immediate needs. We believe that the Department's response to this subsequent recommendation—that appropriate justification be developed by SSA before it acquires additional computer capacity in the near future—addresses our concern and will help lay the foundation for an improved and effective capacity management program at SSA.

The Department of Health and Human Services does not agree with our final recommendation that the Department report the lack of effective capacity management as a material control weakness under the Federal Managers' Financial Integrity Act until an improved program has been implemented. The Department comments that it sees no basis for this recommendation using the established Office of Management and Budget guidelines for the Federal Managers' Financial Integrity Act and our "principles and standards" for defining material weaknesses. The Department recommended that this last recommendation be deleted from the final report.

We have reviewed the August 1988 Office of Management and Budget guidelines for the Federal Managers' Financial Integrity Act and believe that they serve as a basis for this recommendation. Specifically in its guidance, the Office of Management and Budget states that for purposes of determining what constitutes a material weakness in internal control systems (Section 2) the criteria set forth in Office of Management and Budget Circular A-123 shall be used. The criteria provide for reporting weaknesses that among other things, "significantly impair the fulfillment of an agency or component's mission." We believe that SSA's lack of an adequate capacity management program could significantly impair the agency's ability to efficiently fulfill its mission. We have added clarification of this point to the introduction to chapter 3.

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Agency Comments

DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of Inspector General

Washington, D.C. 20201

DEC 2 1988

Mr. Ralph V. Carlone
Division Director
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Carlone:

Enclosed are the Department's comments on your draft report, "Computer Operations: Improvements Needed in Social Security's Capacity Management Program." The enclosed comments represent the tentative position of the Department and are subject to reevaluation when the final version of this report is received.

The Department appreciates the opportunity to comment on this draft report before its publication.

Sincerely yours,

Richard P. Kusserow
Inspector General

Enclosure

COMMENTS OF THE DEPARTMENT OF HEALTH AND HUMAN SERVICES ON THE GENERAL ACCOUNTING OFFICE'S DRAFT REPORT, "COMPUTER OPERATIONS: IMPROVEMENTS NEEDED IN SOCIAL SECURITY'S CAPACITY MANAGEMENT PROGRAM"

General

We believe that this report presents a fair portrayal of the status of the Social Security Administration's (SSA) capacity management program at the time when most of the General Accounting Office (GAO) auditing was performed, which was the latter part of calendar year 1987. After that time, GAO also reviewed the reports on capacity management that were prepared by two contractors under contract to SSA and interviewed some agency officials in mid-1988. But we believe that SSA has made some improvements in its capacity management program during 1988 that GAO is not aware of and, therefore, are not reflected in its report. SSA's capacity management program is in better condition than the GAO assessment would indicate. Nonetheless, we agree with GAO that improvements have to be made.

SSA recently had a detailed study of its capacity management program performed by International Systems Services Corporation (ISS), an expert in the field of capacity planning. While this study gave SSA reasonably high marks, it also made a number of specific recommendations for improvement. We agree that the ISS recommendations are sound and we have developed a comprehensive plan of action to ensure that they are implemented. Some of these recommendations have already been completed and the balance are scheduled for completion by the end of 1989. The ISS study recognized that SSA was already aware of most of the needed improvements and in many cases had already begun corrective action. By the end of 1989 SSA will be in a position where its capacity management program is routinely providing the kind of information needed to, among other things, justify the acquisition of the necessary computer resources.

GAO Recommendation

Ensure that SSA improves its capacity management program as currently scheduled and uses this program to justify future acquisitions.

Department of Health and Human Services Comment

We agree with this recommendation and, as indicated above, SSA is scheduled to implement all of the recommended improvements by the end of 1989. Many improvements have already been made.

GAO Recommendation

Avoid executing major computer acquisitions until an effective capacity management program is in place.

Department Comment

We agree with this recommendation as long as it does not put SSA's mission at risk. Our current plans call for executing a major computer acquisition by the end of 1989 or the beginning of 1990. We believe that we should execute this procurement even if all of SSA's capacity management improvements have not been made by that time, as long as SSA has provided sufficient data to support the procurement. We think it is important to recognize that an organization can develop the data necessary to support a procurement action without necessarily having implemented every recommendation made about its capacity management program.

GAO Recommendation

If SSA believes that computer resources must be acquired to support day-to-day operations before an effective capacity management program is in place, it should demonstrate through sufficient data and thorough analysis that such acquisitions are the most appropriate means for meeting its immediate needs.

Department Comment

We agree with this recommendation. GAO has correctly recognized that SSA should not be precluded from acquiring any necessary computer capacity until we have completed all of our improvements. Current indications are that we will have to acquire some additional capacity in the near future, but we will not proceed until we have developed an appropriate justification.

GAO Recommendation

Report the lack of effective capacity management as a material control weakness under the Federal Managers' Financial Integrity Act (FMFIA) until an improved program has been implemented.

Department Comment

We do not concur with this recommendation. Using the established OMB guidelines for FMFIA and GAO's "principles and standards" for defining material weaknesses, we see no basis for this recommendation and recommend it be deleted from the final report.

Other Matters

Regarding the appropriateness of pilot testing, we agree that SSA did not adequately pilot the use of existing online access to master files. It was our belief that since this access was already available for several years that we could predict with some accuracy the growth that would take place when more terminals having the same access capabilities were installed in the field. What was not anticipated was the significantly higher use of this access capability. Once our field personnel that deal directly with the public had access to information and could answer the public's questions immediately, more information accessing was generated to answer such questions.

SSA did pilot its new modernized claims software extensively. During this pilot operation SSA found additional functions that would improve the claims taking process for the public. These improvements resulted in a need for additional capacity.

SSA agrees that allowing more users to access existing software in a new environment should be piloted and we will fully pilot test, when possible, the complete environment when major changes are made.

Major Contributors to This Report

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